

Assessing Children's Environmental Worldviews: Modifying and Validating the New Ecological Paradigm Scale for Use With Children

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ABSTRACT: The authors revised and validated the New Ecological Paradigm (NEP) Scale for use with upper elementary students. Researchers use the NEP Scale extensively with adults, but it was not designed for children. Interviews with 5th grade students helped the authors revise the NEP Scale for use with children. The authors spent 2 years validating the modified instrument with larger numbers of students. After analyzing their results, the authors suggest that a 3-dimensional modified NEP Scale for Children, with 10 instead of 15 items and revised wording, is appropriate for use with children aged 10–12 years.

KEYWORDS: earth education, environmental worldviews, New Ecological Paradigm Scale

From the late 1960s onward, the growing recognition of the seriousness of environmental problems led to hundreds of studies of environmental attitudes and beliefs. Yet, because many of the studies contributing to this literature had not undergone a rigorous development process from a psychometric point of view, only a modest amount of knowledge accumulated (Dunlap & Jones, 2002; Gray, 1985). Rather than conducting replications with well-established measures, researchers in the majority of studies used instruments developed for a specific project,

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providing little evidence of their validity and reliability (Gray; Leeming, Dwyer, & Bracken, 1995). In a major review, Leeming, Dwyer, Porter, and Cobern (1993) examined 34 studies that assessed changes in environmental attitudes, knowledge, and behavior. They reported finding scales with limited use beyond the original study and little evidence regarding validity and reliability.

These problems are especially apparent in studying children's environmental orientations because few studies have used well-developed instruments. Of all the instruments reviewed by Gray (1985) and by Dunlap and Jones (2002), not one was designed for children. Leeming et al. (1993) reviewed several relevant studies but found only one, Armstrong and Impara (1991), that they felt was of high quality. Leeming et al. (1995) encouraged more research on environmental attitudes and behavior of children because "early attitudes and knowledge shape the later thinking of adolescents and adults" (p. 23), and empirical research in the past had underrepresented this population.

In our study, we present an adaptation of the New Ecological Paradigm (NEP) Scale for use with upper elementary students. As an adaptation of the NEP, the most widely used instrument for studying environmental orientation among adults, our measuring instrument should prove useful for studying children's environmental orientations.

Theoretical Perspective: From the Dominant Social Paradigm (DSP) to the NEP

Numerous early analysts of environmental problems argued that Americans' commitment to abundance, progress, prosperity, laissez faire, individualism, and property rights have contributed to environmental problems and posed barriers to the effective solution of such problems (Caldwell, 1970; Campbell & Wade, 1972; Dunlap & Van Liere, 1978; Whisenhunt, 1974). Three decades ago, Pirages and Ehrlich (1974) pointed out that a new worldview was beginning to challenge the Dominant Social Paradigm (DSP) consisting of the traditional values, attitudes, and beliefs noted above. This new social paradigm or worldview, called the New Environmental Paradigm (NEP) by Dunlap and Van Liere (1978) and more recently the New Ecological Paradigm by Dunlap, Van Liere, Mertig, & Jones (2000), challenges the DSP by rejecting the anthropocentric notion that nature exists solely to serve human needs (Barbour, 1973; Commoner, 1971; Daly, 1973; Meadows, Meadows, Randers, & Behrens, 1972). In addition to rejecting the idea that nature has no value beyond human use, the NEP emphasizes that modern industrial societies are exceeding ecological limits and disrupting ecosystems (Dunlap & Van Liere).

The new worldview has evolved from early concerns about specific environmental problems and natural resources to recognizing that humans may be fundamentally altering the functioning of the global ecosystem, with the result that unpredictable and irreversible changes may occur (Dunlap et al. 2000). What many once viewed as discrete, local problems have evolved into global problems with complex, synergistic causes and unpredictable, possibly irreversible effects. As a result, researchers have made an observable turn toward studying public perceptions and awareness of global ecological problems and the human-environment relationships that produce them (Dunlap, 1998; Stern, 1992).

Recognition of the importance of examining the relationship between modern societies and the environments that produced these problems led to the construction of the 12-item NEP Scale as a means of measuring public acceptance of the emerging paradigm (Dunlap & Van Liere, 1978). Since then, the NEP Scale has become the most widely used measure of environmental concern (Stern, Dietz, & Guagnano, 1995), used in scores of studies, including a growing number outside the United States (Bechtel, Verdugo, & Pinheiro, 1999; Schultz & Zelezny, 1999). Although Dunlap and Van Liere found that the NEP Scale measured a single dimension, others have found that it measures two, three, or even four dimensions (Bechtel et al.; Edgell & Nowell, 1989; Furman, 1998;

Gooch, 1995; Noe & Hammitt, 1992; Noe & Snow, 1989, 1990; Roberts & Bacon, 1997; Scott & Willits, 1994; Shetzer, Stackman, & Moore, 1991).

Researchers recently revised and updated the NEP Scale, renaming it the New Ecological Paradigm Scale (Dunlap et al., 2000). The revised version contains 15 items, three each designed to tap five key facets of the NEP: (a) limits to growth, (b) anti-anthropocentrism, (c) fragility of nature's balance, (d) rejection of human exemptionalism, and (e) belief in eco-crisis. These facets did not form distinct dimensions in the original study because Dunlap et al. found one primary dimension reflecting endorsement of an ecological worldview. The authors suggest, however, that the number of dimensions may vary for different populations and that "in many cases it will no doubt be more appropriate to treat the NEP as multidimensional" (Dunlap et al., p. 436).

Purpose of Our Study

Both the original NEP Scale (Dunlap & Van Liere, 1978) and the revised scale (Dunlap et al., 2000) were designed for use with adults, but many environmental learning programs are designed for children. Assessing environmental worldviews during childhood is of great interest to both those offering such programs and researchers investigating the development of these worldviews.

Recently, researchers have developed new instruments designed to measure children's environmental worldviews, most notably the Children's Attitudes Toward the Environment Scale (CATES; Musser & Malkus, 1994) and the Children's Environmental Attitude and Knowledge Scale (CHEAKS; Leeming et al., 1995). CATES has not been widely used and employs an awkward bipolar answer format, whereas CHEAKS assesses attitudes toward environmental issues through both verbal commitment and self-reported actual behaviors. These instruments measure different dimensions than NEP Scale.

We designed our study to determine if the revised NEP Scale (Dunlap et al., 2000) was suitable for use with children ages 10–12 years and, if so, what modifications were necessary for use with this age group. Our study also investigates whether the belief systems of children, as measured by the NEP, is unidimensional or multidimensional. If the NEP Scale were applicable to children, researchers could (a) investigate children's environmental worldviews and compare children's worldviews with those of adults, using a comparable measure and (b) study how worldviews change as children become adults.

Method

Revision: Year 1

During the revision phase, from February to April 2003, we examined children's comprehension of the NEP Scale through interviews with 30 fifth-grade students (17 girls, 13 boys) from a school in Pennsylvania, who were participants in Earthkeepers, an earth education program (Van Matre & Johnson, 1988). Following our first interview with 13 students, which focused on the vocabulary in the NEP Scale, we revised most of the items to make them more child friendly without changing their meaning. Next, we used the NEP Scale with the revised items in interviews with 17 other fifth graders, checking again for understanding of vocabulary but adding a focus on comprehension of the meaning of the items. On the basis of those interviews, we further revised a few scale items and tentatively constructed the NEP Scale for Children.

Finally, 54 fifth-grade students (32 girls, 22 boys) from two schools in Arizona and Pennsylvania completed the revised scale as a pilot test. The students from Arizona were primarily Caucasian and Hispanic whereas the students from Pennsylvania were mainly Caucasian. The tentative NEP Scale

for Children contained 15 items and the same 5-point Likert-type scoring system used in the adult NEP Scale, with responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). We reversed the scoring for negatively worded items: 1 (*strongly agree*) to 5 (*strongly disagree*). The total scale score ranged from a possible low of 15 (endorsement of the DSP) to a high of 75 (endorsement of the NEP). The midpoint score of 45 can be arbitrarily interpreted as neutrality with regard to the two competing worldviews.

Validation: Year 2

The participants in the first year of the validation phase of the study (September 2003 to April 2004) were 672 fourth-, fifth-, and sixth-grade students from 23 schools in Louisiana and Pennsylvania (52% girls, 48% boys). Students from Louisiana were mostly African American and Caucasian, and students from Pennsylvania were mostly Caucasian. The students had participated in either Earthkeepers (Van Matre & Johnson, 1988) or Sunship Earth (Van Matre, 1979), two earth education programs that were part of their school's curriculum. The schools served students of low- to middle-income levels. Both programs focus on encouraging participants to develop an understanding of ecological concepts, build positive feelings for the natural world, and change their environmental behaviors. Because the authors of the programs designed them to affect students' worldviews and feelings about the earth, they are appropriate for the purpose of this study. The students completed the NEP Scale for Children as a pretest 1 week before they began the earth education programs and as a posttest approximately 1 month after completing the programs.

We made a small change in the scale from Year 1, adding a *Do not understand* response to the Likert-type scale to enable us to further detect problematic items. At the end of Year 2, we randomly split the data in two, using one half for exploratory factor analysis (EFA; principal-components analysis with varimax rotation) and the other half for confirmatory factor analysis (CFA; Pedhazur & Schmelkin, 1991; Tabachnick & Fidell, 1996).

Validation: Year 3

In Year 3 (September 2004 to April 2005), on the basis of the second-year students' responses, we slightly revised the NEP Scale for Children one last time. We eliminated items that received a high rate of the response *Do not understand* in Year 2. The 515 fourth-, fifth-, and sixth-grade students (53% girls, 47% boys) involved in the third-year data collection came from the same schools in Louisiana, Pennsylvania, and Arizona and had participated in either Earthkeepers or Sunship Earth. Using the entire sample, we ran a second CFA to test how well Year 3 data fit the Year 2 model. We also performed a paired sample *t*-test analysis with the 186 students who participated in the Sunship Earth program¹ to validate the scale for its sensitivity to detecting change in children's environmental worldviews as a result of program participation.

Results

Revision: Year 1

During the first set of interviews, we identified 36 words as problematic for most of the students. We replaced those words with easier and more familiar synonyms or short phrases in 13 of the 15 items. During the second set of interviews, only five additional words appeared to be problematic, and 3 of the 17 students had comprehension problems with two items. After a researcher read those items aloud, the students seemed to understand them, suggesting that the problem was in reading rather than understanding. We further revised those two items before including them in the tentative NEP Scale for Children.

Validation: Year 2

EFA. Using a random half ($n = 336$) of the Year 2 sample, an unconstrained EFA initially revealed five factors with Eigenvalues greater than 1.0, explaining 53.68% of the variance. However, several items loaded almost equally on two different factors. We ran further analyses with different items deleted each time. The best solution appeared to be one with 11 of the original 15 items arranged in three factors, explaining 48.6% of the variance (see Table 1). We named the three factors Rights of Nature, Eco-Crisis, and Human Exemptionalism (factors proposed by Dunlap and colleagues; Dunlap & Van Liere, 1978; Dunlap et al., 2000), because a majority of the items on each dimension clearly reflected these facets of an ecological worldview. However, each of the three factors also includes one item that the NEP authors intended as an indicator of a different facet.

CFA. We conducted a structural equation model (SEM) using AMOS software with the second half ($n = 336$) of the sample to test the three-factor, 11-item model resulting from the EFA. In SEM, a researcher posits a theoretical model, in this case on the basis of results of the EFA, and runs an analysis to see how well the data fit the proposed model. In our study, the data were a good fit to the model (see Figure 1). Goodness of Fit Index (GFI = .96), Adjusted Goodness of Fit Index (AGFI = .93), and Comparative Fit Index (CFI = .90) were at or above the frequently recommended minimum level of .90. Root Mean Square of Approximation (RMSEA = .05) is better than the often-recommended

TABLE 1. Exploratory Factor Analysis of the 11-Item New Ecological Paradigm (NEP) Scale for Children in Year 2 ($n = 336$)

Factor	Scale items	Factor		
		1	2	3
1. Rights of Nature	7. People are supposed to rule over the rest of nature.	.695		
	1. Plants and animals have as much right as people to live.	.691		
	4. People must still obey the laws of nature.	.640		
2. Eco-Crisis	10. If things don't change, we will have a big disaster in the environment soon.		.707	
	2. There are too many (or almost too many) people on earth.		.663	
	8. People are treating nature badly.		.733	
	5. When people mess with nature it has bad results.		.459	
3. Human Exemptionalism	3. People are clever enough to keep from ruining the earth.			.667
	6. Nature is strong enough to handle the bad effects of our modern lifestyle.			.614
	9. People will someday know enough about how nature works to be able to control it.			.685
	11. The so-called "environmental crisis" facing people has been blown out of proportion (exaggerated). ^a			.497

Note. Loadings of .35 or less are not included in the table. Eigenvalues for the factors are 2.6 (Factor 1), 1.5 (Factor 2), and 1.2 (Factor 3). The percentage of variance for the factors are 17.0 (Factor 1), 16.4 (Factor 2), and 15.2 (Factor 3). We dropped four items from the scale from the analysis in Year 2.

^aWe dropped this item from the Year 3 analysis because many students had trouble understanding it. We have not included the item in the final version of the NEP Scale for Children.

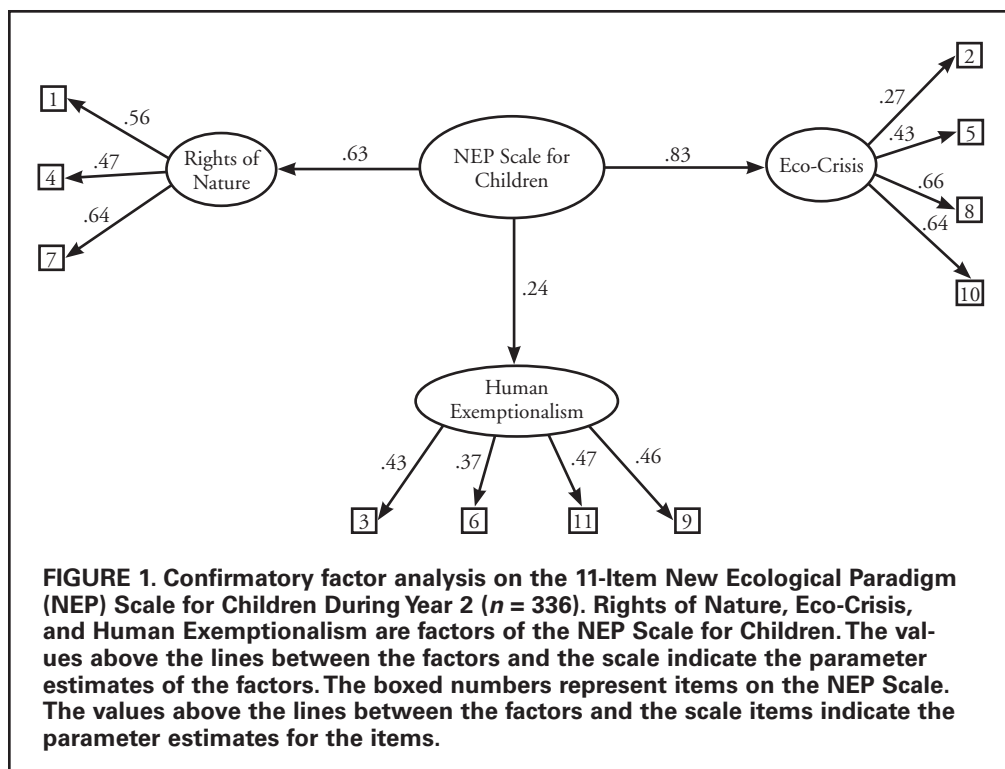
level of .10 and at the level of .05 suggested by others (e.g., Hu & Bentler, 1999). The results thus confirm the factor structure revealed in the EFA analysis (see Table 1).

We also examined values indicating the strength of the relationships shown in the model. First, the values associated with items constituting each of the three factors indicate how well the items within a factor relate to each other. As shown in Figure 1, items within each of the factors have parameter estimates in similar ranges. The exception is in the Eco-Crisis factor, in which Item 1 has a parameter estimate that is substantially lower than the others in that factor. Second, the parameter estimates for the relationships among the three factors show how well the three factors fit together. In this case, Human Exemptionalism has a substantially lower value than have either of the other two factors.

Because the original NEP authors suggested that for an adult sample a one-factor model is best (Dunlap et al., 2000), we also tested a unidimensional model structure. The results, GFI (.91), AGFI (.87), CFI (.64), and RMSEA (.09), were not as good as the results of the three-factor model. Thus, it appears that the three-factor model is more appropriate for these students. The fit for the unidimensional model is not greatly different, however, and it was clear that the model could be improved. Thus, further testing in Year 3 seemed warranted.

Validation: Year 3

CFA. On the basis of student responses, we used only 10 of the 11 items from the Year 2 model in Year 3. We dropped Item 11, “The so-called ‘environmental crisis’ facing people has been blown out of proportion (exaggerated),” because it received a high number of *Do not understand* responses,



indicating that it was difficult for some children to grasp. Table 2 contains the response frequencies in Year 3 for each of the remaining 10 items (renumbered from 1 to 10).

A CFA with the whole sample ($N = 515$) in Year 3 revealed a good fit of the data to the Year 2 CFA model: GFI = .96, AGFI = .93, CFI = .75, RMSEA = .066 (see Figure 2). The results provided further evidence that the three-factor structure offers a good solution for the NEP Scale for Children.

Examination of parameter estimates revealed that the three factors fit together better than they did in Year 2. All three values are between .86 and 1.0, indicating strong relationships. For the most part, the items within each factor also have strong parameter estimates, although one item in Rights of Nature and one in Eco-Crisis does not fit as strongly as do the others. The factor Human Exemptionalism has items with low parameter estimates, indicating that its items do not fit together as strongly as do those in the other two factors.

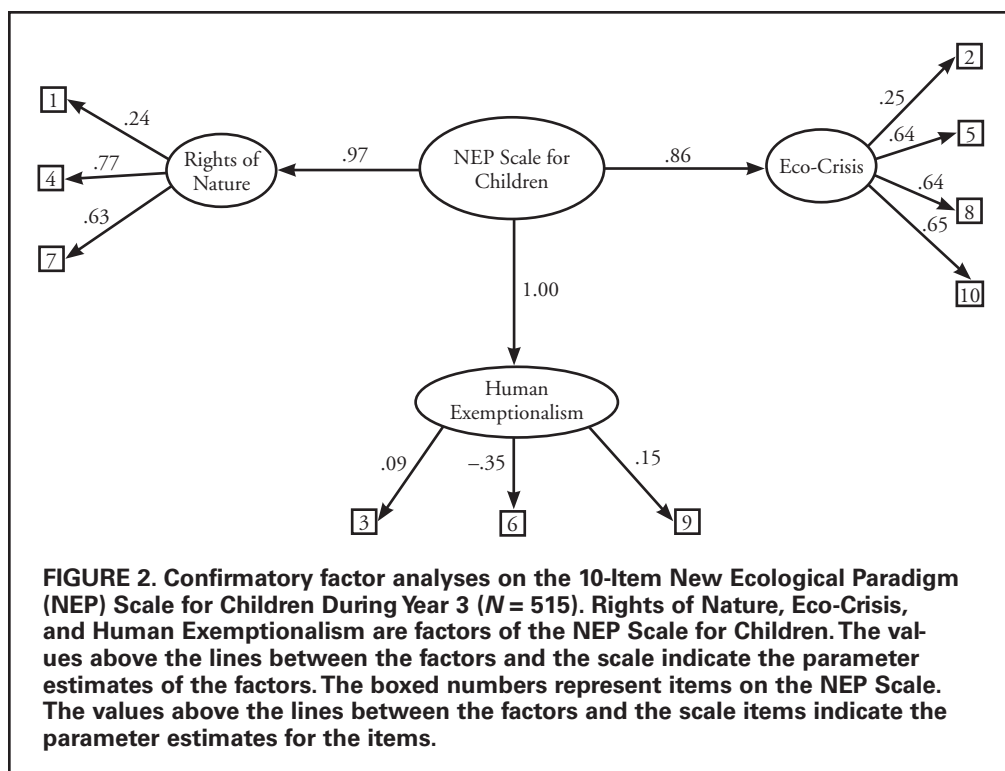
In Year 3, the unidimensional model also fits the data well. Model fit statistics are in the same range as those for the three-factor structure: GFI = .94, AGFI = .90, CFI = .83, RMSEA = .085. Thus, it appears that, for this student sample, we can treat the NEP Scale for Children as three-dimensional, giving each student three separate scores, or as a single measure, giving each student an overall NEP score.

Program assessment. A paired-sample t test of 186 students who participated in the Sunship Earth program provided evidence of the scale's effectiveness in detecting changes in students' environmental

TABLE 2. Frequency Distributions of the Responses to the 10-Item New Ecological Paradigm (NEP) Scale for Children in Year 3 ($N = 515$)

Scale item	Responses (% of students)				
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1. Plants and animals have as much right as people to live.	64.7	22.5	7.6	2.7	2.5
2. There are too many (or almost too many) people on earth.	8.7	15.0	39.0	17.1	20.2
3. People are clever enough to keep from ruining the earth.	18.3	20.2	36.9	14.2	10.5
4. People must still obey the laws of nature.	55.0	24.7	9.9	4.9	5.6
5. When people mess with nature it has bad results.	38.4	28.5	23.5	5.8	3.7
6. Nature is strong enough to handle the bad effects of our modern lifestyle.	7.6	9.9	40.4	25.2	16.9
7. People are supposed to rule over the rest of nature.	6.8	8.2	14.2	27.0	43.9
8. People are treating nature badly.	30.5	34.0	23.7	5.2	6.6
9. People will someday know enough about how nature works to be able to control it.	14.8	21.6	39.0	13.0	11.7
10. If things don't change, we will have a big disaster in the environment soon.	30.5	29.7	27.8	5.4	6.6

Note. Items 3, 6, 7, and 9 (anti-environmental) were reverse scored to obtain an overall NEP score.



worldviews in a pre- and postprogram assessment (see Table 3). We computed factor and total NEP scores using average mean scores (on the 5-point scale) across relevant items: Rights of Nature (1, 4, and 7), Eco-Crisis (2, 5, 8, and 10), and Human Exemptionalism (3, 6, and 9). Items 3, 6, 7, and 9 were reverse scored (i.e., *strongly agree* = 1 instead of 5). Before performing the statistical analysis, we examined the data for normal distribution because distortion violates the assumption on which the t test is based. None of the variables had a distribution far enough from normal for a violation to occur.

TABLE 3. Comparison of Mean Pre- and Posttest Scores on New Ecological Paradigm for Children ($n = 186$)

Factor	Pretest		Posttest		t	df	p	Effect size
	M	SD	M	SD				
Rights of Nature	4.22	.70	4.40	.65	-3.71	185	.000*	.27
Eco-Crisis	3.58	.63	3.72	.67	-2.97	185	.003*	.27
Human Exemptionalism	2.93	.74	3.12	.74	-3.41	185	.001*	.25
Total score for scale	3.58	.47	3.74	.74	-5.51	185	.000*	.39

*Statistically significant difference ($p < .05$) between pre-and posttest scores.

Despite that the majority of students attending the program started with pro-ecological scores on two of the three factors, Rights of Nature and Eco-Crisis, their worldviews changed significantly toward a more pro-ecological perspective after the program (see Table 3). We loosely interpreted the increase in their scores on the factor of Human Exemptionalism, from below the midpoint to above it, as reflecting a shift from a slightly anthropocentric to a slightly ecocentric perspective. Their total scores for the NEP Scale for Children also increased significantly. Although modest in magnitude, all of these changes were statistically significant, as shown in the effect size data in Table 3.

Other studies have evaluated the effect of the Sunship Earth program, but all used study-specific questionnaires (Bires, Johnson, & McFadden, 1982; Keen, 1991; Mulligan, 1989; Payne, 1981; van Wissen, 1992). Those researchers' results have been mixed, with most finding little or no change in attitude. None of the instruments used in those studies, however, were developed using a theoretically sound construct of attitude or worldview. The NEP Scale for Children, designed specifically to measure endorsement of an ecological worldview, revealed that the program produced a significant effect on children's worldviews. Our data clearly indicate that participation in the Sunship Earth program produces a shift toward a more pro-ecological worldview among children.

Conclusion

Our results suggest that the NEP Scale for Children, with 10 instead of 15 items and revised wording, is appropriate for use with children ages 10–12 years. We further found that the instrument measures three interrelated dimensions of the New Ecological Paradigm: Rights of Nature, Eco-Crisis, and Human Exemptionalism. Dunlap et al. (2000) proposed all three of these dimensions in the design of the revised NEP Scale. We also found it possible to treat the scale as a unidimensional measure providing one overall score on the anthropocentric (DSP, low score) to ecocentric (NEP, high score) continuum, after reverse scoring the negatively worded items of the scale (items 3, 6, 7, and 9).

It is not surprising that the change produced by participation in the Sunship Earth program was not large. Before participating in the program, the students held pro-environmental (or pro-ecological) views on two of the three factors as indicated by the pretest scores, leaving little room for change in the pro-ecological direction. Anticipation of participation in the program or classroom activities in preparation for it could have presensitized students toward nature (Bogner, 1998; Howie, 1974). On the other hand, environmental worldviews are deeply rooted beliefs, and change in them appears inevitably to be slow (Bogner). Consequently, for a 5-day intervention to produce statistically significant effects is impressive. The finding is highly valuable because researchers have not conducted comparable studies of potential changes in adult worldviews in response to educational programs.

We are currently using the NEP Scale for Children in studies of students participating in earth education programs in Australia and other parts of the United States. Using the instrument with larger numbers of students in a variety of locations will help determine the generalizability of the NEP Scale for Children. Additional administrations also allow for further testing of the three-dimensional model that emerged in this study. In addition, the NEP Scale for Children can be a useful instrument for evaluating the ability of environmental learning programs to produce changes in environmental worldviews. We are using the NEP Scale for Children along with other instruments, observations, and interviews with children and their parents to investigate the relationships among environmental worldviews, ecological understandings, and environmental actions and how education affects those variables.

Despite the positive results of the study, we must use caution when interpreting the findings. The results may not apply to children in other locations. We cannot generalize our results until we and other researchers have conducted further studies with children from other backgrounds and in other locations.

For more than a quarter of a century, researchers have successfully used the New Environmental Paradigm Scale and the more recent version, the New Ecological Paradigm Scale, to investigate adult environmental worldviews. The NEP Scale for Children allows for similar investigations of how children's environmental worldviews develop, how they change as a result of new experiences or educational programs, and how the environmental worldviews of children from different socioeconomic or cultural backgrounds compare. These are important questions, and the NEP Scale for Children can play an important role in answering them.

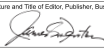
NOTE

1. For pre- and posttest comparison, we selected students who had participated in the Sunship Earth program. Because Sunship Earth is a longer residential program than Earthkeepers, participation in Sunship Earth is more likely to affect worldviews (Bogner, 1998).

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